

USSN 10/077,554

Response to Office Action

REMARKS

Claims 1-37, 44-50, and 55-76 are pending in the application.

The Examiner has withdrawn Claims 38-43, 51-54, and 77-84 from consideration as being drawn to a non-elected species.

Favorable reconsideration and allowance of this application is respectfully requested in light of the remarks that follow.

1. Rejection of Claims 1, 24, 29, 34, 44, 48, 56-58, and 62 Under § 102(b)

Claims 1, 24, 29, 34, 44, 48, 56-58, and 62 stand rejected under § 102(a) as being anticipated by "Admitted Prior Art" (APA) in Figures 1-2 and the specification at pages 1-2. The Applicants respectfully traverse this rejection as it may be applied to the claims because, as is discussed below, the APA does not disclose each and every element of the subject matter disclosed and set forth in the claims. Therefore, reconsideration is in order and is respectfully requested.

The claims require a stiffener that is molded to the substrate of a semiconductor device.

The Examiner's statements mischaracterize the prior art die package illustrated in the Applicants' FIGS. 1-2.

The Examiner states as follows (page 3, 2<sup>nd</sup> paragraph; emphasis added):

As to claims 1 and 44, APA discloses a semiconductor device and method having a substrate or lead frame 6 (fig. 1 and spec., page 1, line 13), and a stiffener 14 *molded to the substrate 6* (fig. 1)...

The Examiner's statement is in error. The APA does not disclose a stiffener 14 molded to the substrate 6. The specification at pages 1-2 describes a prior art die package 2 composed of dies 10 mounted onto a lead frame 6 — and a stiffener element 14. As illustrated in FIGS. 1-2, stiffener 14 is secured to lead frame 6 with adhesive element 12. See FIG. 1 (below):

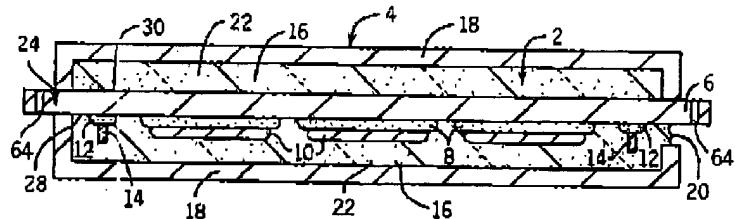


FIG. 1  
(PRIOR ART)

USSN 10/077,554

*Response to Office Action*

The attachment of stiffener 14 by adhesive element 12 is described in the specification at page 1, lines 19-20 (emphasis added):

Referring to FIG. 1, a prior art semiconductor die package 2 disposed within a package mold 4 is shown. Package 2 typically comprises a lead frame 6 (or other substrate), adhesive element 8, one or more dies 10, adhesive element 12, a metal or plastic stiffener 14, and an encapsulating material 16. Package mold 4 comprises mold plates 18. Mold plates 18, as illustrated in FIG. 1, define a mold gate 20 and a cavity 22 disposed within package mold 4.

The package illustrated in FIG. 1 can be assembled by first constructing a die assembly 24. Die assembly 24 comprises one or more dies 10 secured to lead frame 6 with adhesive element 8. After die assembly 24 is assembled, plastic or metal stiffener 14 is secured to lead frame 6 of die assembly 24 with adhesive element 12, and the die assembly is placed between mold plates 18 within cavity 22. Encapsulating material 16 is then introduced into package mold 4, through mold gate 20

Contrary to the Examiner's statement, the APA does not disclose a stiffener 14 molded to the substrate 6. APA describes a stiffener attached by adhesive to a substrate. Accordingly, withdrawal of the rejection of claims 1, 24, 29, 34, 44, 48, 56-58, and 62 and the claims that depend therefrom is respectfully requested.

## 2. Rejection of Claims 2-8, 11, and 37 Under § 103

The rejection of claims 2-8, 11, and 37 as unpatentable over the APA in view of U.S. Patent No. 6,020,221 to Lim et al. is respectfully traversed.

The Examiner maintains that it would be obvious to modify the APA with materials as taught by Lim, and to provide a coefficient of a thermal expansion similar to that of the stiffener, and a substrate having a thickness of 35-100 microns.

Lim et al. teaches an IC assembly 10 comprising a semiconductor die 12 mounted on a substrate 14. The disclosure of Lim et al. fails to cure the base deficiency of the APA. As discussed above, the APA does not disclose a stiffener 14 molded to a substrate 6.

Like the prior art package described by the Applicants in FIGS. 1-2A (the APA), Lim attaches the stiffener member 20 to the substrate 14 by means of an adhesive element 46 in the form of an epoxy resin. Lim teaches placing stiffener member 20 on top of the epoxy resin applied to substrate 14, and applying heat and pressure to bond the stiffener 20 to the substrate 14.

See Lim at col. 4, lines 40-50 and at col. 5, lines 44-47 (emphasis added):

Turning now to FIG. 2, an IC assembly 10 comprises a semiconductor flip chip package or die 12 and a semiconductor flip chip package substrate 14. A stiffener member 20 is attached to a

USSN 10/077,554

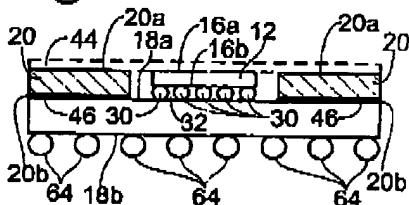
*Response to Office Action*

*major surface of substrate 14. Typically, this is accomplished by dispensing an epoxy resin on top of the substrate 14, or a preformed epoxy material can be placed on the substrate. Stiffener member 20 is then placed on top of the epoxy resin and substrate 14. By applying heat and pressure to the composite structure, the epoxy resin is cured, and bonding between the stiffener member 20 and the substrate 14 will be effected.*

*The lower major surface 20b of stiffener member 20 is joined to the upper major surface 18a of substrate 14 by adhesive material 46, typically an epoxy resin adhesive material....*

The attachment of stiffener 20 to the substrate by adhesive 46 is illustrated in FIG. 8 below:

**Fig. 8**



The references alone or in combination fail to teach or suggest a stiffener molded to a substrate of a semiconductor device, as is required by the claims. Accordingly, withdrawal of the rejection of claims 2-8, 11, and 37 is respectfully requested.

### 3. Rejection of Claims 26, 30-33, and 47 Under § 103

The rejection of claims 26, 30-33, and 47 as unpatentable over the APA in view of U.S. Patent No. 6,517,662 to Culnane et al. is respectfully traversed.

The Examiner maintains that it would be obvious to modify the APA with a substrate having holes for stiffeners to be disposed or molded based on Culnane, to provide a good support for the substrate.

Culnane et al. teaches a semiconductor chip carrier assembly 1 including a flexible substrate 4. Culnane et al. further teaches that the very thin nature of the flexible substrate 4 emphasizes the requirement that it be structurally supported. This support is provided by a stiffener 10.

The disclosure of Culnane et al. fails to cure the base deficiency of the APA. As discussed above, the APA does not disclose a stiffener 14 *molded to* a substrate 6.

USSN 10/077,554

*Response to Office Action*

Like the prior art package described by the Applicants in FIGS. 1-2A (the APA), Culnane teaches attaching the stiffener 10 to flexible substrate 4 with an adhesive 20. See Culnane, for example, at col. 4, lines 26-43 (emphasis added):

*Obviously, the flexible substrate 4 must be bonded to the stiffener 10. In addition to the requirement that the adhesive used to bond the two elements be strong and heat resistant, the adhesive must also be highly conformable to the irregular shape of the first surface 6 of the flexible substrate 4...*

*An adhesive composition 20 provides the critical bonding between flexible substrate 4 and stiffener 10 without electrical communication therebetween.*

The attachment of stiffener 10 to the substrate 4 by adhesive 20 is illustrated by Culnane in FIG. 2 below:

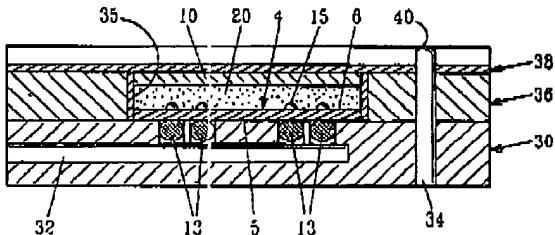


FIG. 2

The references alone or in combination fail to teach or suggest a stiffener molded to a substrate of a semiconductor device, as is required by the claims. Accordingly, withdrawal of the rejection of claims 26, 30-33, and 47 is respectfully requested.

CONCLUSION

Extension of Term. The proceedings herein are for a patent application and the provisions of 37 CFR § 1.136 apply. Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that Applicant has inadvertently overlooked the need for a petition for extension of time. If any extension and/or fee are required, please charge Account No. 23-2053.

USSN 10/077,554

*Response to Office Action*

It is respectfully submitted that the claims are in condition for allowance and notification to that effect is earnestly solicited. The Examiner is urged to telephone the undersigned attorney if any questions should arise.

Respectfully submitted,

*Mary E. Eberle*

Mary E. Eberle  
Reg. No. 43,599

Dated: January 4, 2005

WHYTE HIRSCHBOECK DUDEK S.C.  
555 East Wells Street, Suite 1900  
Milwaukee, Wisconsin 53202-3819  
(414) 273-2100

Customer No. 31870

MAD/102511.2

6 of 6